EMERALD ASH BORER PREPAREDNESS PLAN
for the STATE of TEXAS

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Texas A&M AgriLife Extension Service (TAES)
Texas Department of Agriculture (TDA)
Texas A&M Forest Service (TFS)
Texas Parks and Wildlife Department (TPWD)
USDA Animal and Plant Health Inspection Service, Plant Protection and Quarantine (APHIS PPQ)
US Forest Service, Forest Health Protection (FHP)

Public Outreach Team:
Lady Bird Johnson Wildflower Center (LBJWC)
Texas Invasive Plant and Pest Council (TIPPC)
Texas Invasive Species Coordinating Committee (TISCC), composed of representatives from six state agencies:
Texas A&M AgriLife Extension Service (TAES)
Texas Department of Agriculture (TDA)
Texas A&M Forest Service (TFS)
Texas Parks and Wildlife Department (TPWD)
Texas State Soil and Water Conservation Board (TSSWCB)
Texas Water Development Board (TWDB)

Introduction

The emerald ash borer (EAB), *Agrilus planipennis* (Coleoptera: Buprestidae), is a non-native wood-boring pest of ash trees (*Fraxinus* spp.). This devastating pest was first discovered in North America in 2002 where it was found in southeastern Michigan and adjacent areas in Windsor, Ontario, Canada. EAB is thought to have been introduced in the 1990s on solid wood packing material originating from Asia. As of April 2014, infestations subsequently have spread to Colorado, Connecticut, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Minnesota, Missouri, New Hampshire, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, Wisconsin, and Quebec - See more at: http://www.emeraldashborer.info/map.cfm#sthash.SzaFUNIb.dpuf

EAB poses an enormous threat to all species of ash in North America. Unlike many other wood boring beetles, EAB aggressively attacks and kills both healthy and stressed trees. Long distance dispersal has been associated with movement of infested firewood. Given the current rate of spread, EAB is likely to eventually move into Texas. Nine native species of ash are represented by vouchers in established herbaria, and ash is an important component of urban landscapes as well as forested areas in Texas.

To adequately respond to the potential threat of EAB, State and Federal agencies, herein designated the Core Team, met to create an **Emerald Ash Borer Preparedness Plan for the State of Texas**. This plan was developed based on the expertise of the entities involved and from plans enacted in states already affected by EAB. The objective of the plan is to minimize the economic and environmental impacts of EAB infestation in Texas. This purpose of this plan is to serve as a guide and actions identified herein are subject to change.

Background

Insect identification. Adult beetles are bright metallic green, and 7.5-13.5 mm in length. The top of the abdomen, visible when the wings are spread, is a metallic red or purple. The larvae are white, flattened, and reach a length of 10-14 mm. The larva has a brown head and a pair of brown pinchers on the last abdominal segment. Larval identification is especially difficult, as there are many similar looking beetle larvae that may be found in ash trees. More detailed information about EAB identification can be found at http://www.emeraldashborer.info/files/eab_id_guide.pdf

Life history. EAB generally has 1 generation per year, but it is unknown whether multiple generations could occur as its range expands southward. Some beetles may take 2 years to complete development. In Texas, it is predicted that adult emergence within critical areas of the state would occur from March through June. Along the Gulf Coast and in South Texas, adult emergence could occur as early as February, based on the APHIS day-degree model. Adults are active during the day and feed on the margins of ash leaves. The adult lifespan is 3-6 weeks. Adults mate soon after emergence, and

females lay eggs singly or in small groups in bark crevices. Each female can produce 60-90 eggs during her life. After egg hatch, the larvae bore through the bark and begin feeding in the cambium. The larvae create winding, S-shaped galleries that are packed with fine frass. There are 5 larval instars. Late-instar larvae bore into the sapwood to complete development. The beetles overwinter in prepupal chambers formed in the outer sapwood.

Damage identification. Emerging adults create D-shaped exit holes in the branches and on the bole (similar to other species of buprestid beetles). Larval tunneling in the phloem can be observed by peeling away the bark. Larval activity can cause 5-10 cm vertical splits in the bark. Infested trees may exhibit canopy dieback, which starts at the top of the tree and progresses downward. Epicormic shoots may be produced on the trunk. Trees as small as 5 cm in diameter may be attacked and killed. Only species of ash (*Fraxinus* spp.) are attacked.

For more information on EAB damage and life history, visit the EAB website at http://www.emeraldashborer.info.

Risk Assessment

Up-to-date maps of ash occurrence are essential tools for assessing the threat of EAB in Texas and identifying likely areas of introduction. USDA Animal and Plant Health Inspection Service – Plant Protection Quarantine (APHIS-PPQ) will create and maintain necessary ash and beetle maps, with input from members of the core team. Maps will be reviewed annually and updated as needed. Responsibilities will include:

1. Creating a map of ash distribution and abundance in Texas utilizing:
   a. Historical data
   b. Forest Inventory and Analysis (FIA) data
   c. Forest Health Technology Enterprise Team (FHTET) tree coverage layers
   d. City tree surveys
   e. Site-specific information if available from land management agencies including TPWD, USFS, TFS, TDA, Nature Centers, National Park Service (NPS), and US Army Corps of Engineers (USACE)
   f. Site-specific information if available from county extension agents, Master Naturalists, Citizen Scientists, or other groups

2. Identifying and mapping areas of high risk, as indicated by:
   a. High ash density
   b. Points of entry of imported solid wood packing material
   c. Proximity to campgrounds, recreation sites, or other sites with high out-of-state visitor traffic and potential importation of firewood. Use visitor information (zip codes) and surveys to identify high risk sites.
   d. Nurseries with large stock of imported ash
   e. Sawmills receiving out-of-state ash logs

Detection

Early detection is critical in limiting impacts of EAB once it is introduced or spreads into Texas. In accordance with PPQ's EAB survey guidelines, traps and visual surveys will be used to detect EAB. When annually funded, APHIS-PPQ will coordinate EAB trapping in Texas. Recent cooperative agreement funding has been provided to Texas A&M Forest Service to conduct the detection trapping. APHIS-PPQ will develop a map of trap locations annually and distribute them to core team members prior to March of each year. Based on proposed trap locations, other agencies may supplement the trapping effort, and will report their trap locations to APHIS-PPQ for inclusion on the map.

Key Agencies/Organizations**:**
USDA-APHIS-PPQ, Texas A&M Forest Service, Lady Bird Johnson Wildflower Center, Texas A&M AgriLife Extension Service, and Sam Houston State University

1. Traps
   a. Trap annually. Have traps in place before predicted adult flight.
   b. Trap type and lures will be selected on best available science.
   c. Trap numbers and locations will be based on ash density and/or EAB risk maps/models.
   d. Contracts and/or volunteer groups will be utilized to install and monitor traps.
   e. Traps will be monitored at least twice during the adult flight season.

2. EAB identification
   a. Volunteer groups checking traps will select one person for EAB ID training. The selected person will examine all suspect EAB and make initial, tentative identifications of EAB collected in Texas.
   b. All suspect EAB specimens will be sent to an APHIS-PPQ taxonomist for confirmation.
   c. All suspect dead and dying ash trees will be reported to a local Texas A&M Forest Service office or county extension agent for further examination.

3. Reporting
   a. Data from the organized trapping program will be entered into IPHIS (USDA/APHIS/PPQ) data system per terms of contract
   b. Each agency or volunteer group involved with detection will designate a reporting coordinator.
   c. The group contact will report annual detection results to APHIS-PPQ either directly or via the Internet.
   d. APHIS-PPQ will maintain detection database and post results on-line. Results will be available on www.texasinvasives.org (LBJWC).
   e. Groups conducting tree surveys will report the areas surveyed. Annual survey maps will be developed and posted on-line at www.texasinvasives.org (LBJWC).

Response

APHIS-PPQ and TDA will take the lead in response to positive identification of EAB in Texas. The response will be coordinated with land management agencies or landowners in areas around the detection site. The type of response will depend on the extent and location of detected infestations. USDA-APHIS-PPQ and various state Departments of Agriculture have developed draft response plans for EAB:

http://www.emeraldashborer.info/communityplan.cfm#sthash.kAWx8X7f.dpbs

These plans will help guide possible responses to infestations in Texas.

Key Agencies:
USDA-APHIS-PPQ, TDA, USFS, Texas A&M Forest Service, Texas A&M AgriLife Extension Service

Response actions could include:

1. Visual surveys. Ash in the vicinity of the detection site will be surveyed for evidence of EAB infestation.

2. Delimiting surveys.

    a. A grid of detection traps will be established around the detection site to determine extent of the infestation. USDA-APHIS-PPQ and TDA will determine the appropriate trapping grid and will annually reassess the need for further delimiting trapping in the area.
    b. Tree surveys. In addition to traps, tree surveys will be conducted to identify potential EAB sites.
        i. Volunteer groups (Master Naturalists, Master Gardeners, Citizen Scientists, etc.) will survey local ash trees for decline and death at least annually.
        ii. All volunteer ash surveyors will be trained and certified.
        iii. Both classroom and Web-based training and certification will be developed and utilized. Web training will be maintained on the invasive species website at www.texasinvasives.org (LBJWC).
    c. Surveyors must request permission and receive consent to enter private lands. A sample consent form is posted at: http://www.texasinvasives.org/invaders/CS_Resources/Datasheet_2012.pdf

3. Tree removal. Infested and perhaps un-infested ash will be removed to inhibit infestation expansion.

a. Responsibility for tree removal will rest with Texas A&M Forest Service or the jurisdictional entity, e.g., local government, US Forest Service, US Army Corps of Engineers.
b. Local ordinances will guide tree removal within communities.

c. Tree removal on private lands outside of city limits will be addressed as authorities allow.

d. Funding for tree removal is the responsibility of the landowner or land management agency.

e. State and federal funding for EAB suppression will be sought if necessary in the event of a potential outbreak.

4. Extent of surveys and tree removals will be based on perceived threat: ash density, number of beetles collected, environmental conditions, etc.

5. Chemical suppression. Insecticides registered by the Environmental Protection Agency and registered by TDA for use against EAB and with proven efficacy may be used to suppress EAB populations and prevent spread. If necessary, the Texas Department of Agriculture will seek a Special Local Need Section 24(C) state label for efficacious insecticides not yet labeled for EAB suppression.

6. Disposal of infested material. Processing facilities for infested trees will be established within quarantine zones. Sample regulatory guidelines for processing of infested material are available at http://www.aphis.usda.gov/wps/portal/aphis/ourfocus/importexport?1dmy&urile=wcm%3apath%3a%2Faphis_content_library%2Fsa_our_focus%2Fsa_plant_health%2Fsa_domestic_pests_and_diseases%2Fsa_pests_and_diseases%2Fsa_insects%2Fsa_emerald_ash%2Fct_regulatory

7. Biological control. Currently-approved biological control options will be considered for EAB infested areas. Biocontrol for EAB is considered a long-term management strategy, and the option to release parasitoids will be evaluated by APHIS-PPQ program managers. As of April 2014, there are three available parasitoids in the US: *Spathius agrili*, *Tetrastichus planipennisi*, and *Oobius agrili*.

   More information on EAB biocontrol can be found at: http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/downloads/eab-biocontrol.pdf

8. Preventative insecticide treatments
   a. For protection of high-value trees (recreation areas, urban areas, etc.)
   b. Only EPA and TDA registered insecticides and systemics that have proven efficacy against EAB will be used. see:

http://www.emeraldashborer.info/files/multistate_eab_insecticide_fact_sheet.pdf

c. Recommended only when ash trees are at high risk (EAB has been detected within10-15 miles).

9. Quarantines on movement of regulated articles including ash logs, lumber, firewood, seedlings, or other ash products from the infested counties will be imposed as necessary by APHIS-PPQ and the Texas Department of Agriculture.

Prevention

Prevention activities will delay or avert the accidental introduction of EAB into the state.

Key Agencies/Organizations:
USDA-APHIS-PPQ, USFS, Texas A&M Forest Service, Texas Parks & Wildlife, Texas A&M AgriLife Extension Service, Lady Bird Johnson Wildflower Center

1. Institute a *Don't Move Firewood* campaign.
   a. Posters at campsites, visitor centers, etc.
   b. Ensure that any firewood brought into campsites from non-local sources is utilized quickly and completely and not left on site.
   c. Information on the spread of non-native invasive pests through firewood movement on camping, recreation, agency, and other websites. Provide a link to www.texasinvasives.org (LBJWC).
   d. Leaflets, magnets, key chains, etc. available for hand out at public events.
   e. Contact businesses that sell firewood to alert them to the threat of non-native pests and provide information on EAB.

2. Reverse quarantine
   a. Voluntary restriction on import of ash logs, lumber, firewood, seedlings, etc. from out of state. If necessary to control firewood movement and facilitate inspection, require all importers of firewood to register with the Texas Department of Agriculture. A sample registration application form is located at http://www.illinoiseab.com/.
   b. Use education and outreach to mills and merchants selling firewood to reduce potential import of infested material. The Public Outreach Team will distribute educational materials.
   c. Ensure that local sources of firewood are available in or near campgrounds and recreational sites.
   d. Educate nurseries, contractors, garden centers, etc. on the importance of knowing the source of ash nursery stock.

3. Promote diverse landscapes
   a. Encourage municipalities and large landowners to maintain diversity in tree planting to reduce the threat and impact of non-native pests.

Environmental Analyses

Tree removals, pesticide applications, and other treatments to suppress or prevent EAB infestations generally require some level of environmental analysis.

1. Each agency may determine the level of environmental analysis required (decision memo, environmental assessment, etc.). Samples of environmental assessments and records of categorical exclusions for EAB suppression projects are posted at http://www.aphis.usda.gov/wps/portal/aphis/ourfocus/planthealth?1dmy&urile=wcm%3apath%3a%2Faphis_content_library%2Fsa_our_focus%2Fsa_plant_health%2Fsa_domestic_pests_and_diseases%2Fsa_environmental_assessments%2Fct_eab

2. Goal: have analysis in place before EAB is detected in Texas.

3. Long-term analysis desirable. Review and update as needed.

Restoration

Quick and well-planned restoration of areas affected by EAB should serve to mitigate some of the adverse impacts.

Key Agencies/Organizations:
Texas A&M AgriLife Extension Service, Texas A&M Forest Service, Lady Bird Johnson Wildflower Center

1. Ideally trees should be removed while still infested, as removal of dead trees no longer infested is the responsibility of the land management agency or landowner. Texas A&M AgriLife Extension Service, local tree boards, etc. will work with landowners and municipalities to identify and help remove trees killed by EAB.

2. Encourage replanting by cities and homeowners to maintain green space. Recommend consultation with arborists, tree boards, etc. to determine what species to plant. A Texas tree planting guide by county is available on the Texas A&M Forest Service web site at http://texastreeplanting.tamu.edu/. If possible create diverse landscapes. If replanting with ash, use EAB-resistant species if available.

3. Collect and store seed from uninfested ash trees surviving in infested areas.

4. Explore additional funding options to prioritize ash seed banking efforts by Lady Bird Johnson Wildflower Center.

Public Outreach and Education

Public awareness is important in all facets of the EAB Preparedness Plan, and will be coordinated by the Public Outreach Team. The following are some of the avenues the Outreach Team will use to disseminate information on EAB.

Key Agencies/stakeholder groups:
USDA-APHIS-PPQ, USFS, Texas A&M Forest Service, Texas Parks & Wildlife Department, Texas A&M AgriLife Extension Service, Lady Bird Johnson Wildflower Center

1. Websites
   a. Emeraldashborer.info
   b. Hungrypests.com
   c. Don't Move Firewood campaign
   d. Detection training and certification
   e. Detection reporting
   f. Texas A&M University Department of Entomology websites
   g. Texas Forest Service website

2. Leaflet design and distribution

3. Poster design and distribution

4. Other informational material design and distribution, e.g. magnets, key chains

5. Newspaper, newsletter, radio and TV spots

6. Public awareness group presentations at meetings of Master Naturalists, garden clubs, Texas Forestry Association, forest landowner councils, etc.

7. Information booths at forestry and agricultural expos, state meetings, etc.

Plan Review

The core team will review the plan annually and revise as needed based on current EAB activity and research. The observed efficacy of the Texas and other State preparedness plans will be considered in any revisions.

Agency Representative Signatures

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